

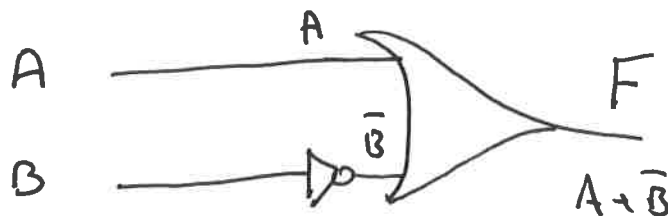
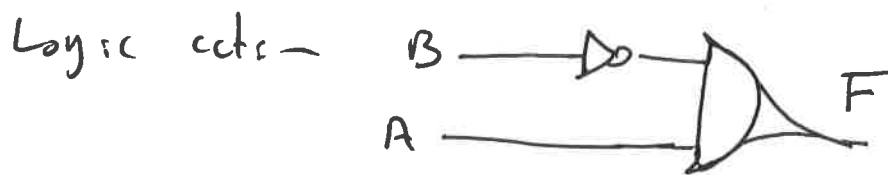
- ① truth table
- ② write the eq. from the T.T
- ③ Simplify the eq.
- ④ Draw the Logical cct.

Ex)

<u>A</u>	<u>B</u>	<u>F</u>
0	0	1
0	1	1
1	0	0
1	1	1

Solⁿ:-

$$\begin{aligned}
 F &= \bar{A}\bar{B} + A\bar{B} + AB \\
 &= \bar{B}(A + \bar{A}) + AB \\
 &= \bar{B} + AB \\
 &= A + \bar{B}
 \end{aligned}$$



Derivation of Boolean Expression :-

- ① Sum of Product (SOP)
- ② Product of Sum (POS)

① Sum of Product

i/p		o/p		product term	minterm
A	B	F _i	F _i		
0	0	0	0	$\bar{A}\bar{B}$	m_0
0	1	0	0	$\bar{A}B$	m_1
1	0	1	1	$A\bar{B}$	m_2
1	1	1	1	AB	m_3

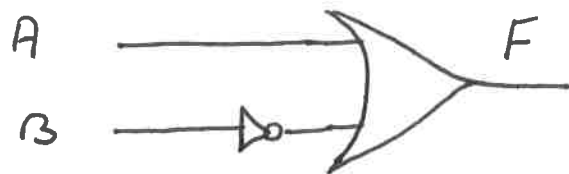
$$F = m_0 + m_2 + m_3$$

$$= \bar{A}\bar{B} + A\bar{B} + AB$$

$$= AB + \bar{B}(A + \bar{A})$$

$$= AB + \bar{B}$$

$$= A + \bar{B}$$



Sum of product :-

A (SOP), Sum terms when all the variables are known minterm, a SOP expression is a product logically added together

Ex) $F = AB + \bar{A}B + A\bar{B}$

$$\text{Sol}^{\wedge}: - \quad F(A,B) = \sum 1, 2, 3$$

A	B	F
0	0	0
0	1	1 ✓
1	0	1 ✓
1	1	1 ✓

② Product of Sum (POS)

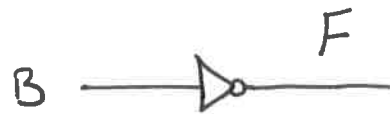
A (POS) expression is sum terms logically multiplied together.

$$\text{Ex)} \quad F = (A+B+C)(B+C+\bar{D})(A+\bar{C}+D)$$

$\bar{A} = 1$	$\bar{A} = 0$
$A = 0$	$A = 1$
<u>Pos</u>	<u>Sop</u>

A	B	F	Sum term	max term
0	0	1	$A+B$	M_0
0	1	0 ✓	$A+\bar{B}$	M_1
1	0	1	$\bar{A}+B$	M_2
1	1	0 ✓	$\bar{A}+\bar{B}$	M_3

$$\begin{aligned} \therefore F &= (A+\bar{B})(\bar{A}+B) \\ &= A\bar{A} + A\bar{B} + \bar{A}B + \bar{B} \\ &= A\bar{B} + \bar{A}B + \bar{B} \\ &= \bar{B}(A+\bar{A}) + \bar{B} \\ &= \bar{B} + \bar{B} \\ &= \bar{B} \end{aligned}$$



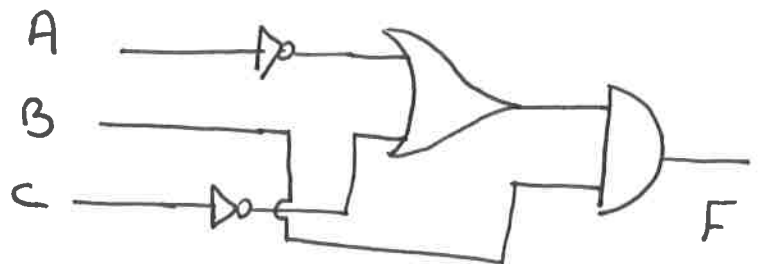
$$\therefore F(A,B) = \pi 1, 3$$

Ex) Find the Simplest Logical expression as (SOP) & (POS) for the following truth table and graph the function?

i/p			o/p	SOP term	minterm	POS term	max term
A	B	C	F				
0	0	0	0	$\bar{A}\bar{B}\bar{C}$	m_0	$A+B+C$	M_0
0	0	1	0	$\bar{A}\bar{B}C$	m_1	$A+B+\bar{C}$	M_1
0	1	0	1	$\bar{A}B\bar{C}$	m_2	$A+\bar{B}+C$	M_2
0	1	1	1	$\bar{A}BC$	m_3	$A+\bar{B}+\bar{C}$	M_3
1	0	0	0	$A\bar{B}\bar{C}$	m_4	$\bar{A}+B+C$	M_4
1	0	1	0	$A\bar{B}C$	m_5	$\bar{A}+B+\bar{C}$	M_5
1	1	0	1	$AB\bar{C}$	m_6	$\bar{A}+\bar{B}+C$	M_6
1	1	1	0	ABC	m_7	$\bar{A}+\bar{B}+\bar{C}$	M_7

$$SOP = \sum 2, 3, 6$$

$$\begin{aligned}
 F &= \bar{A}B\bar{C} + \bar{A}BC + AB\bar{C} \\
 &= \bar{A}B(C + \bar{C}) + AB\bar{C} \\
 &= \bar{A}B + AB\bar{C} \\
 &= B(\bar{A} + A\bar{C}) \\
 &= B(\bar{A} + \bar{C})
 \end{aligned}$$



$$POS = \pi 0, 1, 4, 5, 7$$

$$F = (A+B+C)(A+B+\bar{C})(\bar{A}+\bar{B}+\bar{C})(\bar{A}+B+\bar{C})(\bar{A}+B+C)$$